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| EXAMINER |
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FAN, CHIEH M

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| ART UNIT | PAPER NUMBER |
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2634

DATE MAILED: 04/02/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

09/240,632

Applicant(s)

MURAKAMI ET AL.

Examiner

Chieh M Fan

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 December 2003.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-13,33,37-39,41-44,46,49,51,53-55 and 57-73 is/are pending in the application.
4a) Of the above claim(s) 60-73 is/are withdrawn from consideration.
5) ☒ Claim(s) 1,3,5,7,9,11 and 13 is/are allowed.
6) ☒ Claim(s) 4,6,8,10,12,38,39,41-44,46,49,51,53-55 and 57-59 is/are rejected.
7) ☒ Claim(s) 33 and 37 is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 01 February 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 18.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the amendment filed on 12/29/03.

The applicants are reminded that the non-elected claims 60-73 are still pending in the application. Claims 60-73 need to be canceled before allowance.

Claim Objections

1. Claims 33, 37 and 53-59 are objected to because of the following informalities:

Regarding claims 33 and 37, the limitation "wherein the first modulation is at least 8-signal-point modulation, and the second modulation is phase shift keying" recited in lines 8-9 of claim 33 is redundant because such limitation has been recited in lines 5-6 of claim 33.

Regarding claims 53-59, "one of claims 49 or 51" recited in the first line of each of claims 53, 56, 57, and 59 should be changed to -- one of the claims 49 and 51 -- or -- claims 49 or 51 --.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 4, 6, 8, 10 and 12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4 depends on claim 2, which is a canceled claim. The scope of claim 4 is therefore indefinite. Further, although claim 4 is listed as "original", it is not the same as its previous version.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 38-40, 42-47, 49, 51 and 53-58 are rejected under 35 U.S.C. 102(b) as being anticipated by Seki et al. (EP 0734132 A2, provided by the applicants in IDS received 8/2/02, PTO Paper # 8).

Regarding claims 38 and 39, Seki et al. teaches a modulation method for modulating an input digital signal into a multi-value symbol stream, the modulation method comprising:

generating a first multi-value modulation signal (see 11 in Fig. 3, also see col. 10, lines 16-20) having first multi-value symbols with a first modulator; generating a second modulation signal (see 14 in Fig. 3) containing second multi-value symbols by using a second modulator which are to be used as a pilot symbol estimating at least one of (1) a channel distortion and (2) a frequency offset for demodulating said first multi-value modulation signal in a receiver; inserting said second multi-value symbols into said first multi-value symbols such that the resulting multi-value symbols constitute said multi-value symbol stream (See col. 7, lines 46-58; col. 10, lines 16-22; col. 8, line 57 through col. 9, line 10; col. 13, lines 4-13; and col. 16, lines 50-58. Note that since the QPSK signal is used to detect the amplitude offset and the phase offset, the QPSK signal is considered to be a pilot signal.); and wherein said first symbol is demodulated by using said second symbol which is not a known prescribed pattern, but a part of information to be transmitted and received (col. 19, lines 41-50).

Regarding claim 40, Seki et al. also teaches that the second modulation signal, i.e., QPSK signal, is differentially encoded (col. 1, lines 20-35).

Regarding claims 42-44, Seki et al. further teaches the second modulation signal may be any type of PSK signals (col. 18, lines 43-46).

Regarding claim 45-47, Seki et al. further teaches that the first modulation signal is a 16-QAM signal (col. 7, line 11). Seki et al. also teaches that QAM may be replaced by another modulation method or multiple modulation methods (col. 18, lines 46-49). The first modulation signal of Seki et al. therefore can be a QPSK signal.

Regarding claim 49, Seki et al. teaches a transmission apparatus comprising a first multi-value modulation system for subjecting an input digital signal to first modulation and outputting a first quadrature baseband signal, a second modulation system for subjecting an input digital signal to a second modulation and outputting a second quadrature baseband signal, wherein the second quadrature baseband signal regularly is inserted as a pilot signal into the first quadrature baseband signal wherein said second quadrature signal is used for estimating a frequency offset and a channel distortion, and wherein amplitude and phase distortion amounts of a receiver are derived from the second quadrature baseband signal. (See col. 7, lines 46-58; col. 10, lines 16-22; col. 8, line 57 through col. 9, line 10; col. 13, lines 4-13; and col. 16, lines 50-58. Note that since the QPSK signal is used to detect the amplitude offset and the phase offset, the QPSK signal is considered to be a pilot signal.)

Regarding claim 51, Seki et al. also teaches that the second modulation signal, i.e., QPSK signal, is differentially encoded (col. 1, lines 20-35).

Regarding claims 53-55, Seki et al. further teaches the second modulation signal may be any type of PSK signals (col. 18, lines 43-46).

Regarding claim 56-58, Seki et al. further teaches that the first modulation signal is a 16-QAM signal (col. 7, line 11). Seki et al. also teaches that QAM may be replaced by another modulation method or multiple modulation methods (col. 18, lines 46-49). The first modulation signal of Seki et al. therefore can be a QPSK signal.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 48 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seki et al. (EP 0734132 A2, provided by the applicants in IDS received 8/2/02, PTO Paper # 8).

Regarding claim 48, Seki et al. teaches the claimed invention including that the first modulation signal is a 16 QAM signal and the second modulation signal is PSK signal (see the rationale applied to claim 38 above). Seki et al. does not particularly teach that a distance between signal points of the 16 QAM in an I-Q plane is equal to a given value (such as 2 or in a range of 0.9-1.5) times a distance between signal points of the PSK in the I-Q plane. However, it is clear the distance between signal points of the 16QAM or QPSK in the I-Q plane in the system of Seki et al. is merely an arbitrary design choice, dictated by system conditions such as how noisy the system is. When there is more noise, the distance between signal points would need to be wider to reduce error.

Regarding claim 59, Seki et al. teaches the claimed invention including that the first modulation signal is a 16 QAM signal and the second modulation signal is PSK

signal (see the rationale applied to claims 49 and 53-58 above). Seki et al. does not particularly teach that a distance between signal points of the 16 QAM in an I-Q plane is equal to a given value (such as 2 or in a range of 0.9-1.5) times a distance between signal points of the PSK in the I-Q plane. However, it is clear the distance between signal points of the 16QAM or QPSK in the I-Q plane in the system of Seki et al. is merely an arbitrary design choice, dictated by system conditions such as how noisy the system is. When there is more noise, the distance between signal points would need to be wider to reduce error.

8. Claims 49, 53-55 and 57-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuya (US Patent 5,577,087) in view of Alamouti et al. (US Patent 5,933,421).

Regarding claim 49, Furuya teaches a transmission apparatus comprising a first multi-value modulation system (40 in Fig. 4) for subjecting an input digital signal to a first modulation and outputting a quadrature baseband signal, a second modulation system (50 in Fig. 4) for subjecting an input digital signal to a second modulation and outputting a second quadrature baseband signal, wherein the second quadrature baseband signal is regularly inserted into the first quadrature baseband signal (note that the outputs of 16QAM and QPSK have I and Q components).

Furuya does not teach that the second modulation signal is used as a pilot signal to derive the amplitude and phase distortion amounts of a receiver.

Alamouti et al. teaches a communication system, wherein pilot symbols are inserted in the QPSK symbols to be transmitted (col. 15, lines 42-48). The pilot symbols

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are used to provide an accurate representation of the channel response, i.e. the amplitude and phase distortion introduced by the communication characteristics (col. 12, lines 58-63).

It is known in the art that the channel distortion needs to be estimated and removed or compensated in the receiver such the received signal can be accurately demodulated to recover the transmitted data. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide pilot symbols in the QPSK signal of Furuya to estimate the channel distortion, such that the received signal can be accurately demodulated to recover the transmitted data at the receiver.

Regarding claims 53-55, Furuya teaches that the second modulation is QPSK (50 in Fig. 4).

Regarding claims 57, and 58, Furuya teaches that the first modulation is 16QAM (40 in Fig. 4).

Regarding claim 59, Furuya does not particularly teach that a distance between signal points of the 16 QAM in an I-Q plane is equal to a given value (such as 2 or in a range of 0.9-1.5) times a distance between signal points of the PSK in the I-Q plane. However, it is clear the distance between signal points of the 16QAM or QPSK in the I-Q plane in the system of Furuya is merely an arbitrary design choice, dictated by system conditions such as how noisy the system is. When there is more noise, the distance between signal points would need to be wider to reduce error.

9. Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over Furuya (US Patent 5,577,087) in view of Alamouti et al. (US Patent 5,933,421) as applied to claim 49 above, and further in view of Wong (US Patent 5,027,372).

Furuya in view of Alamouti et al. teaches all the subject matter of the claimed limitation except that the PSK modulation is differential phase shift keying (DPSK). However, DPSK is a well-known variation of basic PSK modulation technique. It has been long practiced in the art. Wong teaches that the use of DPSK instead of PSK would have the advantage of not needing to transmit a phase reference (col. 2, lines 25-26). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use DPSK instead of PSK in the system of Furuya, such that a reference phase is not required.

Response to Arguments

10. Applicant's arguments filed 12/29/03 have been fully considered but they are not persuasive.

The applicants argue that *the system described by Seki et al. requires not only QPSK information symbols, but also reference symbols for carrying the demodulation of the signal. The reference symbol is a fixed data, which is not the part of the main information being transmitted. This is to be distinguished from the present invention, which does not utilize any reference symbols, but rather demodulates the first signal using the QPSK symbol, which carries information and is not strictly a reference signal.*

The applicants also make similar argument with respect to the references Furuya in view of Alamouti et al.

Examiner's response --- In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the demodulation of the first signal does not utilize any reference symbols) are not recited in the rejected claim(s).

(a) With respect to claims 38-40, 42-44 and 46-48, independent claim 38 only recites "wherein said first symbol is demodulated by using said second symbol which is not a known prescribed pattern, but a part of information to be transmitted and received." Claim 38 never mentions whether the reference symbols are used or not. As admitted by the applicants, the Seki reference uses both the QPSK information symbols and the reference symbols for demodulation. Therefore, the Seki reference clearly teaches using the QPSK information symbols for demodulation as claimed. The rejections are thus maintained. Moreover, the examiner in the previous Office Action has addressed the issue of "only the second modulation signal is necessary for demodulation" or "the demodulation does not use any reference symbols". The applicants, however, still bring up the same issue in the present amendment again. The applicants are reminded that the present invention also transmits a reference symbol (see, for example, 12c in Fig. 2). The reference symbols are used in acquiring synchronization between the transmitter and a receiver during an initial stage of signal transmission (see page 19, lines 21-24 in the specification of the present invention). Initial synchronization such as carrier recovery (that is, locking the local clock to the

carrier) is an essential step of demodulation in a receiver. Therefore, it is clear both the reference signal and the second modulation signal (pilot signal) are explicitly required for demodulation in the present application. The argument of "*only the second modulation signal is necessary for demodulation*" and "*no other reference signal is needed for demodulation*" is deemed to be incorrect.

(b) With respect to claims 49, 51, 53-55 and 57-59, it is again noted that the features upon which applicant relies (i.e., the demodulation of the first signal does not utilize any reference symbols) are not recited in the rejected claim(s). In fact, the word "demodulation" does not even appear in the independent claim 49. Based on the same reason above, the rejections are maintained.

Allowable Subject Matter

11. Claims 1, 3, 5, 7, 9, 11 and 13 are allowed. Claims 33 and 37 would be allowable is rewritten to overcome the claim objections stated in Paragraph 1 of this Office Action.

Claims 1, 3, 5, 7, 9, 11, 13, 33 and 37 are allowable over the prior art of record because the prior art of record does not teach or suggest the limitation "the at least 8-signal-point modulation assigns logic states of the input digital signal to respective signal points for a first symbol in response to a signal point used by a second symbol of the phase shift keying which precedes the first symbol."

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chieh M Fan whose telephone number is (703) 305-0198. The examiner can normally be reached on Monday-Friday 8:00AM-5:30PM, Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (703) 305-4714. The fax phone numbers

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for the organization where this application or proceeding is assigned are (703) 872-9314 for regular communications and (703) 872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4700.



Chieh M Fan
Primary Examiner
Art Unit 2634

cmf
March 24, 2004